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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002952048 for a patent by U.S. FILTER WASTEWATER GROUP, INC. as filed on 11 October 2002.

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Twenty-second day of October 2003

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AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:-

"BACKWASH METHOD"

The invention is described in the following statement:-

TITLE: BACKWASH METHOD

FIELD OF THE INVENTION

The present invention relates to membrane filtration systems, and more particularly to those systems employing porous or permeable membranes located in a tank or cell open to atmosphere and a backwash method and arrangement therefor.

BACKGROUND ART

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

Porous membrane filtration systems require regular backwashing of the membranes to maintain filtration efficiency and flux while reducing transmembrane pressure (TMP) which rises as the membrane pores become clogged with impurities. Typically, during the backwash cycle the impurities are forced out of the membrane pores by pressurised gas, liquid or both into the feed tank or cell. The liquid containing impurities and deposits from the membranes is then drained or flushed from the tank.

The waste liquid displaced from the tank needs to be disposed of or reprocessed, usually in an environmentally safe manner, so any reduction in the

volume of such waste liquid is seen as advantageous in terms of environmental impact and cost.

The draining or flushing of the tank, particularly when large arrays of membranes are used also requires time which results in down time of the filtration cycle. In order to reduce this down time large pumping systems are required to quickly drain and refill the tank. Where tanks or cells are arranged in banks and feed is used to refill the tank, a lowering in levels in other cells may be produced during the refill process. This again impinges on operating efficiency of the filtration system.

Further, in filtration systems employing gas bubble scouring of the membranes it has been found advantageous to confine the bubbles as much as possible in the region of the membranes to assist with the scouring process.

Reduction in backwash volume also reduces the volume of chemical cleaning agents required in some systems. This has the two-fold advantage of reducing cost in terms of chemical requirements while also reducing waste disposal problems.

Minimising the footprint of filtration systems is also desirable in terms of space eventually occupied by the filtration plant. Compact systems have lesser impact on the environment and are more acceptable to the market.

It has been found advantageous to reduce the volume of feed liquid in the filtration cell as well as confine scouring bubbles as much as possible in order to ameliorate the above problems and provide at least some of the advantages outlined above.

DISCLOSURE OF THE INVENTION

The present invention seeks to overcome one or more of the abovementioned problems of the prior art, provide one or more of the advantages outlined above or at least provide a useful alternative.

According to one aspect, the present invention provides a filtration arrangement including one or more membrane modules positioned vertically within a feed tank, each membrane module having one or more membranes positioned therein, an aeration hood having an upper wall and one or more downwardly extending side walls configured to shroud said membrane modules within said tank, said aeration hood including a number of open-ended tubes, each extending downwardly from said upper wall and forming a respective opening therein, each tube adapted to have at least one of said modules mounted therein and extending through said respective openings in the upper wall so as to at least partially surround an outer periphery of an associated module or modules, one or more aeration openings being provided in each tube at a location spaced from a proximal end of said tube, said aeration hood side wall or walls extending to below the location of said aeration openings in said tubes, and gas providing means for feeding gas into said hood.

For preference, the aeration openings are provided at or adjacent the distal end of each tube and the aeration hood side wall or walls extend to or below the downward extent of a distal end of said tubes.

Preferably, each membrane module has an associated tube surrounding an outer periphery thereof. For preference, the openings comprise a number of through holes located around the periphery of each tube and spaced from the

distal end of said tube. In one form, the gas providing means may comprise an aeration header located below the aeration hood.

According to another aspect, the present invention provides a method of cleaning membrane modules in arrangement according to the above aspect including the steps of:

i) suspending the filtration operation;

ii) displacing feed liquid within the aeration hood to a level below the location of said aeration openings in each tube by feeding gas into said aeration hood while maintaining a liquid seal with the distal end of each tube;

iii) passing said gas through said aeration openings into said tubes and along surfaces of membranes within each membrane module to dislodge accumulated fouling materials therefrom;

iv) recommencing the filtration operation.

BRIEF DESCRIPTION OF THE DRAWING

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawing which shows a pictorial perspective view of one preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, the arrangement consists of a rack of membrane modules 5 suspended in an open feed tank 6 having a feed inlet 7. The modules 5 are suspended from a group manifold 8 which in turn is connected to main filtrate conduit 9 which extends across the top of the tank 6 and connects

to each of the manifolds 8. Located and supported within the tank 6 is a hollow structure forming an aeration hood 10 consisting of an upper wall 11 and side walls 12 and 13. The aeration hood 10 has four side walls (two of which have been cutaway to show the internal configuration of the filter arrangement) and is open at its base. The aeration hood 10 further includes a number of open-ended tubes 14 corresponding to the number of membrane modules 5 which extend downwardly from the upper wall 11 and form openings 15 therein. Each module 5 is accommodated within a corresponding tube 14 which at least partially surrounds the outer periphery of each module 5. Adjacent the distal end 16 of each tube 14 and spaced around the circumference of the tube 14 is a row of aeration holes 17. The size and number of aeration holes will vary with type and size of module and requirements in terms of maintaining a desired pressure drop to ensure a liquid seal with the distal end 16 of the tube 14. While holes are shown, a variety of openings may be used including slots extending upwardly from the end of the tube 14. The use of slots may provide self-regulation of the desired pressure drop. A series of aeration lines 18 are provided along the bottom 18 of the feed tank 6.

The aeration and cleaning process according to this embodiment may be described as follows. The filtration process is suspended and backwash commenced with backwash gas, typically air, being supplied from aeration lines 18 under the aeration hood 10 so as to bubble up into the void space between the tubes 14. It will be appreciated that gas could also be fed directly into the aeration hood 10 through a pipe or the like. The gas that bubbles up from the aeration lines 18 displaces feed liquid from within the aeration hood 10. The liquid level in the aeration hood 10 drops until it is below the row of aeration

holes 17 near the distal end 16 of the tubes 14. The gas then flows through the holes 17 and into the sides of the module 5 suspended inside the tubes 14. This gas then provides a scrubbing action to scour the membranes within the module 5, whilst the tubes 14 serve to contain the gas within the module 5 thus promoting more effective cleaning.

The distal end 16 of the tube typically extends about 50 to 100mm below the aeration holes 17 in the tube 14, though it will be appreciated that the aeration holes may be located at any desired location along the length of the tube 14. The pressure drop across the aeration holes 17 is selected to ensure that a liquid seal is maintained between the holes 17 and the end 16 of the tubes 14. A gap 19 may also be provided between the end 16 of the tube 14 and the bottom 20 of the module 5 to allow solids to exit from the bottom 20 of the modules.

While the invention has been described in relation in relation to a feed tank open to atmosphere, it will be appreciated that the invention is equally applicable to a closed, pressurized filtration system.

It will be appreciated that further embodiments and exemplifications of the invention are possible without departing from the spirit or scope of the invention described.

Dated this 11th day of October, 2002

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